

Maryland Streams Extension Activity One

Water Quality Rating



Objective: Students will learn about Water Quality Ratings (WQR) and how to determine whether a stream is healthy.

Procedure: Students will calculate the WQR at each fictional stream site and decide which stream areas are healthy. If the WQR is low, the students will then determine the reason why.

Calculation: Students will be given a fictional stream survey that lists the sensitive, somewhat sensitive, and tolerant macroinvertebrates that were found. Letter codes are given to determine the number of organisms found in a 3-foot by 3-foot area. Next, the students will add up the number of letters in each box. The point values stay the same, regardless of the number of organisms (letter codes). Lastly, they will multiply the number in each box by either 3, 2, or 1 depending on whether the organisms are sensitive, somewhat sensitive, or tolerant.

Example

Letter Codes (A=1-9, B= 10-99, C= 100) – number of organisms found

Sensitive Organisms= 3 points

Somewhat Sensitive= 2 points

Tolerant= 1 point

SENSITIVE

B caddisfly larvae
 ___ hellgrammite
A mayfly nymphs
 ___ gilled snails
 ___ riffle beetle adult
 ___ stonefly nymphs
 ___ water penny larvae

SOMEWHAT SENSITIVE

A beetle larvae
 ___ clams
 ___ crane fly larvae
 ___ crayfish
 ___ damselfly nymphs
 ___ dragonfly nymphs
 ___ scuds
A sowbugs
A fishfly larvae
 ___ alderfly larvae

TOLERANT

___ aquatic worms
 ___ blackfly larvae
A leeches
 ___ midge larvae
 ___ pouch snail

2 # of letters times 3
6 index value

3 # of letters times 2
6 index value

1 # of letters times 1
1 index value

- Now add together the three index values from each column for your total index value.
- 13 Total index value

Water Quality Rating

Excellent >22

Good

17-22

Fair

11-16

Poor

<11



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 580 Taylor Avenue
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Robert L. Ehrlich, Governor
 Michael S. Steele, Lt. Governor
 C. Ronald Franks, Secretary
 W.P. Jensen, Deputy Secretary





Maryland Streams Extension Activity One

Water Quality Rating – Student Survey

Directions: Read each scenario and calculate the Water Quality Rating (WQR) using the stream quality handouts. If the WQR is below a water quality rating of **Good**, state what environmental factors may be affecting the water quality and what you could do to improve the WQR in that stream.

Sample A: Joe Smith is interested in building a home on some property next to the Patapsco River. He is especially interested in buying this property because it seems reasonable. Joe wants to make sure that the stream is in good condition before he buys the property so he hires you to calculate the WQR. Sample A is located about three quarters of a mile downstream from a metal factory. The factory used solvents to clean the metal and stream water to cool down the metal. Should Joe Smith purchase the property?

Sample B: Susan Button is looking to open a fishing shop, which will sell fishing equipment and bait. Her shop will also offer fishing lessons to anyone that is interested. Susan has found a empty building that is for sale on the Soldier's Run. She wants to make sure that the stream has an abundance of game fish (i.e. brook trout). Susan decides to hire you to take some samples and to calculate the WQR. Should Susan Button purchase the building?

Sample C: Henry and Roberta Sutton own a house on the outskirts of Brookstone Estates. They have lived there for 10 years now and have three young children. Often times, Roberta lets the kids go and play in the Eastern Branch Stream that runs next to their development. Recently, Brian has been coming home and complaining of an abundance of dead animals such as fish and frogs lying next to or floating in the stream. Henry and Roberta are concerned and so are their neighbors. They decide to hire you to research and calculate the Water Quality Rating of the stream. What they are not aware of, is that a little under two years ago, a farm was developed 5 miles South of their development. What advise can you give the Sutton's on their problem.



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Extension Answer Key

Sample A- The WQR should equal nine, which makes the Patapsco River a poor quality stream. Therefore, Joe Smith should not purchase the property. The river seems polluted because of the factory that is located three quarters of a mile upstream from the property.

Sample B- The WQB equals twenty-four which makes Soldier's Run an excellent quality stream. Susan Button should purchase the building because there will be an abundance of fish.

Sample C- The WQB equals fourteen, which makes Eastern Branch a fair quality stream. The Sutton's are now able to go to the town and complain of pollution in the stream. Pollution in the stream is due to the farm located 5 miles south of their development.

Possible Answers to Discussion Questions

1. What information does a water quality rating provide? A water quality rating provides us with information that will tell us how healthy or not healthy a stream is. It also provides us with the types and numbers of organisms in a 3-foot by 3-foot area.
2. How reliable is a Water Quality Rating? A water quality rating can be reliable but is not completely accurate. It is not completely accurate because the sample may not have been taken perfectly. Weather conditions could have a negative impact on the sample. Unless many samples are taken from different parts of the stream it is difficult to get an accurate rating.

Differentiations

Students that finish early can use the blank survey on the back of sample C to create their own data and scenario. Have students get into partners to figure out the water quality rating.



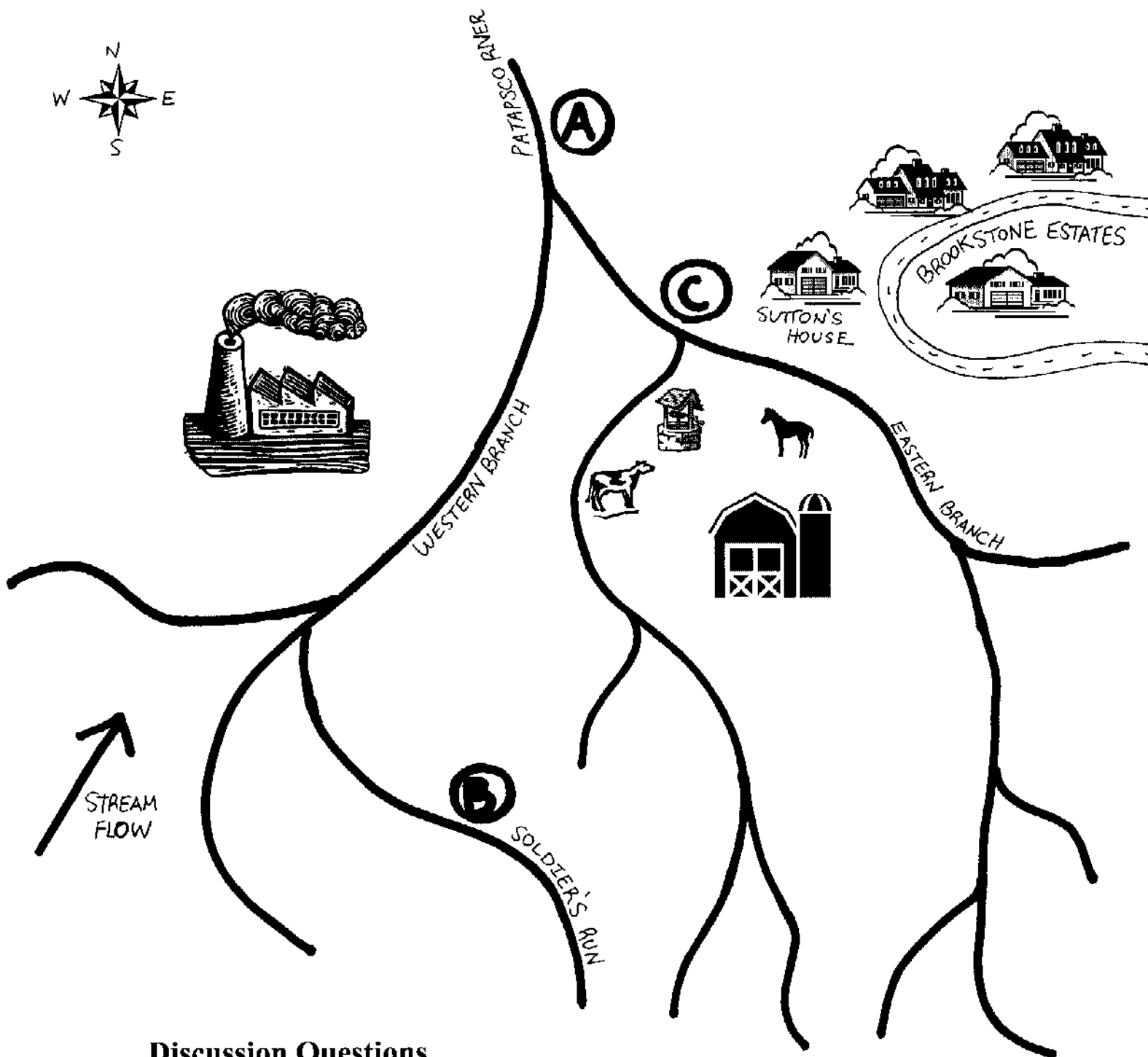
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Maryland Streams Extension Activity One

Map of Streams



Discussion Questions

1. What information does a Water Quality Rating provide?
2. How reliable is a Water Quality Rating?

Stream Quality Survey

October 1994

Name of reviewer: _____

Date reviewed: _____

Data sent to: _____

The purpose of this form is to aid you in gathering and recording important data about the health of your stream. By keeping accurate and consistent records of your observations and data from your macroinvertebrate count, you can document changes in water quality. Refer to the SOS insect card and monitoring instructions to learn how to trap and identify stream macroinvertebrates and how to complete this form.

Stream PATAPSCO RIVER Station # A # of participants 1

County Anne Arundel State MD Group or individual student

Location Central Maryland

Weather conditions (last 72 hours) Sunshine

Date _____ Average stream width 10 ft. Average stream depth 12 in.

Start Time _____ End Time _____ Flow rate: High _____ Normal X Low _____ Negligible _____

If conducting rocky bottom sampling, select a riffle where the water is not running too fast, the water depth is between 3-12 inches, and the bed consists of cobble-sized stones or larger. Monitored riffle area (3' x 3' square) _____ Water depth _____ in., in riffle. Water temperature _____ F° ? C° ? Take 3 samples in the same general area. Count each separately and report the highest-scoring sample below. Sample _____ reported of 3.

If conducting muddy bottom sampling, take the required number of scoops from each habitat type: steep banks/vegetated margin (10 scoops), woody debris with organic matter (4 scoops), rock/gravel/sand substrates (3 scoops), and silty bottom with organic matter (3 scoops).

MACROINVERTEBRATE COUNT

Use the stream monitoring instructions to conduct a macroinvertebrate count. Use letter codes (A = 1-9, B = 10-99, C = 100 or more) to record the numbers of organisms found in a 3 foot by 3 foot area. Add up the number of letters in each column and multiply by the indicated index value. The following columns are divided based on the organism's sensitivity to pollution.

SENSITIVE	SOMEWHAT SENSITIVE	TOLERANT
_____ caddisfly larvae	_____ beetle larvae	<u>A</u> aquatic worms
_____ hellgrammite	_____ clams	<u>B</u> blackfly larvae
_____ mayfly nymphs	_____ crane fly larvae	<u>A</u> leeches
_____ gilled snails	_____ crayfish	<u>B</u> midge larvae
_____ riffle beetle adult	_____ damselfly nymphs	_____ pouch (and other) snails
_____ stonelly nymphs	_____ dragonfly nymphs	
<u>A</u> water penny larvae	_____ scuds	
	<u>A</u> sowbugs	
	_____ fishfly larvae	
	_____ alderfly larvae	
	_____ atherix	
_____ # letters times 3 =	_____ # letters times 2 =	_____ # letters times 1 =
_____ index value	_____ index value	_____ index value

Now add together the three index values from each column for your total index value. Total index value = _____

Compare this total index value to the following ranges of numbers to determine the water quality of your stream. Good water quality is indicated by a variety of different kinds of organisms, with no one kind making up the majority of the sample. Although the A, B, and C ratings do not contribute to the water quality rating, keep track of them to see how your macroinvertebrate populations change over time.

WATER QUALITY RATING

_____ Excellent (>22) _____ Good (17-22) _____ Fair (11-16) _____ Poor (<11)

Stream Quality Survey

October 1994

Name of reviewer: _____

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Stream SOLDIERS RUN Station # B # of participants 1

County Anne Arundel State MD Group or individual Student

Location Central Maryland

Weather conditions (last 72 hours) Rain followed by 2 sunny days

Date _____ Average stream width 10-20 ft. Average stream depth 1-2 ft.

Start Time _____ End Time _____ Flow rate: High _____ Normal X Low _____ Negligible _____

If conducting rocky bottom sampling, select a riffle where the water is not running too fast, the water depth is between 3-12 inches, and the bed consists of cobble-sized stones or larger. Monitored riffle area (3' x 3' square) _____ Water depth _____ in., in riffle. Water temperature _____ F° ? C° ? Take 3 samples in the same general area. Count each separately and report the highest-scoring sample below. Sample _____ reported of 3.

If conducting muddy bottom sampling, take the required number of scoops from each habitat type: steep banks/vegetated margin (10 scoops), woody debris with organic matter (4 scoops), rock/gravel/sand substrates (3 scoops), and silty bottom with organic matter (3 scoops).

MACROINVERTEBRATE COUNT

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SENSITIVE		SOMEWHAT SENSITIVE		TOLERANT	
<u>A</u>	caddisfly larvae	<u>A</u>	beetle larvae	<u>A</u>	aquatic worms
<u>A</u>	hellgrammite	_____	clams	_____	blackfly larvae
<u>A</u>	mayfly nymphs	<u>A</u>	crane fly larvae	_____	leeches
<u>A</u>	gilled snails	_____	crayfish	_____	midge larvae
<u>A</u>	rifle beetle adult	_____	damsel fly nymphs	_____	pouch (and other) snails
<u>B</u>	stonefly nymphs	<u>B</u>	dragonfly nymphs		
<u>B</u>	water penny larvae	<u>A</u>	scuds		
		_____	sowbugs		
		_____	fishfly larvae		
		_____	aldertly larvae		
		_____	atherix		
_____	# letters times 3 =	_____	# letters times 2 =	_____	# letters times 1 =
_____	index value	_____	index value	_____	index value

Now add together the three index values from each column for your total index value. Total index value = _____

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WATER QUALITY RATING

_____ Excellent (>22) _____ Good (17-22) _____ Fair (11-16) _____ Poor (<11)

Stream Quality Survey

October 1994

Name of reviewer: _____
 Date reviewed: _____
 Data sent to: _____

The purpose of this form is to aid you in gathering and recording important data about the health of your stream. By keeping accurate and consistent records of your observations and data from your macroinvertebrate count, you can document changes in water quality. Refer to the SOS insect card and monitoring instructions to learn how to trap and identify stream macroinvertebrates and how to complete this form.

Stream Eastern Branch Station # C # of participants 1
 County Anne Arundel State MD Group or individual student
 Location Central Maryland
 Weather conditions (last 72 hours) Rain
 Date _____ Average stream width 5-10 ft. Average stream depth 1 ft.
 Start Time _____ End Time _____ Flow rate: High _____ Normal _____ Low X Negligible _____

If conducting rocky bottom sampling, select a riffle where the water is not running too fast, the water depth is between 3-12 inches, and the bed consists of cobble-sized stones or larger. Monitored riffle area (3' x 3' square) _____ Water depth _____ in., in riffle. Water temperature _____ F° ? C° ? Take 3 samples in the same general area. Count each separately and report the highest-scoring sample below. Sample _____ reported of 3.
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_____ hellgrammite	_____ clams	_____ blackfly larvae
_____ mayfly nymphs	<u>A</u> crane fly larvae	<u>B</u> leeches
_____ gilled snails	<u>A</u> crayfish	_____ midge larvae
_____ riffle beetle adult	_____ damselfly nymphs	_____ pouch (and other) snails
_____ stonefly nymphs	<u>B</u> dragonfly nymphs	
_____ water penny larvae	<u>A</u> scuds	
	_____ sowbugs	
	_____ fishfly larvae	
	<u>A</u> alderfly larvae	
	_____ atherix	
_____ # letters times 3 =	_____ # letters times 2 =	_____ # letters times 1 =
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Stream _____ Station # _____ # of participants _____

County _____ State _____ Group or individual _____

Location _____

Weather conditions (last 72 hours) _____

Date _____ Average stream width _____ ft. Average stream depth _____ ft.

Start Time _____ End Time _____ Flow rate: High _____ Normal _____ Low _____ Negligible _____

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_____ stonefly nymphs	_____ dragonfly nymphs	
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	_____ sowbugs	
	_____ fishfly larvae	
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